

Impact Parameter Dependence of J/ψ and Drell-Yan Production in Heavy-Ion Collisions at $\sqrt{s_{NN}} = 17.3$ GeV*

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A significant ‘anomalous’ suppression of J/ψ production has been observed in Pb+Pb collisions. The ratio of J/ψ to Drell-Yan production is lower in central Pb+Pb collisions than suggested by more peripheral collisions, lighter ion interactions, and pA collisions [1]. Centrality is inferred from the transverse energy, E_T .

Almost all calculations of J/ψ and Drell-Yan production in nuclear collisions have been based on position independent structure functions. However, nuclear shadowing should depend on the parton's location inside the nucleus and may be proportional to the local nuclear density.

We calculate the impact parameter dependence of nuclear shadowing on J/ψ and Drell-Yan production in heavy ion collisions and show that it has an important effect on the E_T dependence of J/ψ and Drell-Yan production if the quark and gluon distributions are shadowed differently. We focus on shadowing alone.

The ratio $\sigma^{J/\psi}/\sigma^{\text{DY}}$ increases at small b (large E_T) compared with more peripheral collisions. The magnitude of the effect depends on the shadowing parameterization. Neglecting shadowing could increase K_{exp} at $\sqrt{s_{NN}} = 17.3$ GeV since the measured cross section is more strongly affected by shadowing than the extrapolated cross section. In addition, using an impact parameter averaged spectra in central collisions would tend to underestimate the total number of Drell-Yan pairs, increasing $\sigma^{J/\psi}/\sigma^{\text{DY}}$. If this effect could be identified and corrected for in the data, then $\sigma^{J/\psi}/\sigma^{\text{DY}}$ would rise $\sim 10\%$ at low E_T and drop $\sim 4\%$ at high E_T , enhancing the discrepancy between absorption models and the data. At higher $\sqrt{s_{NN}}$, such as at future heavy-ion colliders, the shadowing effect will be larger since these colliders probe lower x values.

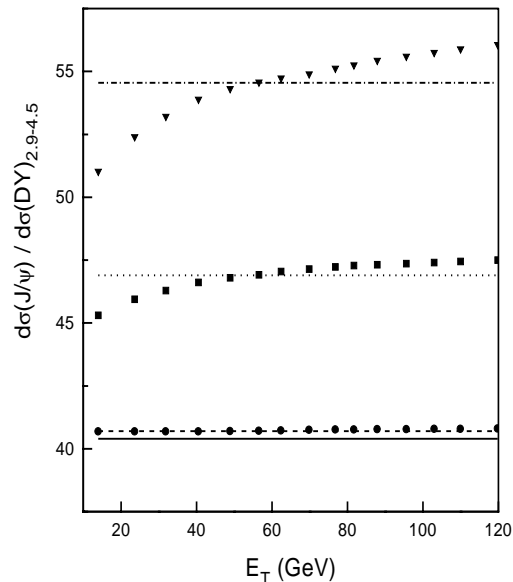


Figure 1: The ratio of J/ψ to Drell-Yan production, as a function of transverse energy, E_T . The curves correspond to b -averaged results with S_1 (dashed), S_2 (dotted) and S_3 (dot-dashed). The spatial dependence is illustrated for $S_{1,ws}$ (circles), $S_{2,ws}$ (squares) and $S_{3,ws}$ (triangles).

[1] M.C. Abreu *et al.* (NA50 Collab.), Phys. Lett. **B410**, 337 (1997); Phys. Lett. **B410**, 327 (1997).

*LBNL-42170; submitted to Phys. Rev. Lett.

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